Atmos. Chem. Phys. Discuss., 14, C13025–C13026, 2015
www.atmos-chem-phys-discuss.net/14/C13025/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Interactions of bromine, chlorine, and iodine photochemistry during ozone depletions in Barrow, Alaska" *by* C. R. Thompson et al.

Anonymous Referee #3

Received and published: 21 April 2015

The paper examines interactions and contributions of halogens (bromine, chlorine, and iodine) to ozone depletion at Barrow using a 0D photochemical model. The model is run during an ODE event during which observations of O3, VOCs and OVOCs, CO, Cl2, Br2, HOBr, BrO, ClO, NO2, OH and HO2 were available. In general the paper is well written and organized. I report some comments and suggestions.

It takes me a certain time to realize which species was measured and how they were used with respect to model simulations. I think since the paper mainly deals with model simulations it would be great to first present in a short section the measurements (Fig. 1 and 2, and Table 5) and better explain why the model is constrained by measure-

ments for Cl2 but not for Br species. Also, page 28698, it is stated that "The fluxes of HONO, NO2 and I2 were scaled to JNO2 since HONO and NOx (and likely I2) are photochemically produced (Honrath et al., 1999; Zhou et al., 2001; Saiz-Lopez et al., 2011). All fluxes, with the exception of I2, were adjusted in order to agree with observed gas-phase concentrations of the respective species. Âż However HONO is not listed in Table 5 ? I was unable to get typical values of the encountered mixing ratio of HONO in the paper? Also concerning HONO, you only consider a flux of HONO and not the recently pointed out production of HONO from reaction of the HO2 (H2O) complex with NO2 (Lin et al., 2014) ? Li, X. et al.: Missing Gas-Phase Source of HONO Inferred from Zeppelin Measurements in the Troposphere, Science, 344, 292–296, 2014.

On Figure 1 and 2, a double scale showing both concentrations and mixing ratio would be useful (for readers more familiar to compare values of mixing ratios).

Page 28697, second paragraph: I am not sure if the discussion of estimated Br2 emission from the snow is very useful here since it is very clear that the estimations are based on numerous assumptions including the values assumed for the quasi liquid layer. If you decide to report this discussion it would be important for the reader to report assumed bulk concentrations of Cl- and Br- in snow since even after 30 minutes of reading the paper from Krnavek et al. (2011) I was unable to guess the values that you have used.

End of the review

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 28685, 2014.